CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

This chapter describes potential environmental consequences that would occur as a result of implementation of the proposed PSS ocean test. The following analysis focuses on those resources that have the potential to be affected by the proposed action (the proposed ocean test location) and the No-Action Alternative.

4.1 GEOLOGY, TOPOGRAPHY, AND SOILS

4.1.1 PSS Ocean Test Location

The PSS system will be fully located at-sea aboard a test barge and as such would have no impact upon the geology, topology, or soils.

4.2 AIR QUALITY

4.2.1 Approach to Analysis

For the purposes of evaluating the significance of impacts, the state and federal attainment status for the affected air basin was used to identify *de minimis* thresholds. The evaluation of potential air quality impacts includes two separate analyses for the reasons identified below:

Clean Air Act (CAA) General Conformity Analysis

To make an applicability determination pursuant to the General Conformity Rule (42 USC 7401 *et seq.)*, the analysis focuses on operations that could potentially impact designated federal and state nonattainment areas within the project area. The CAA Conformity Applicability Analysis is presented below and includes an analysis of the applicability of the General Conformity Rule to the proposed action. For the purpose of evaluating the proposed action, emissions were estimated to assess whether the proposed action is subject to the provisions of the General Conformity Rule and the requirements to conduct a conformity determination. Because the proposed action is not specifically exempted under the provisions of the General Conformity Rule, it was necessary to compare the proposed project's emissions with *de minimis* levels that apply for the area in which impacts from the proposed action would occur (Table 4-1).

Table 4-1. Applicable *de minimis* Levels for San Diego Air Basin (tons/year)

	San Diego
Conformity Analysis	
VOC	50
NO_x	50
SO_x	*
CO	100
PM_{10}	*

*The affected air basin is in attainment for regulated pollutant.

To assess the impact of air pollutant emissions from proposed PSS operations, the analysis focuses on those effects that would occur within the San Diego Air Pollution Control District (SDAPCD).

Emissions associated with the ocean test would be dependent upon equipment and operational mode, rather than location. Impacts resulting from the proposed action were applied to the corresponding onshore attainment status. However, the total emissions of each criteria pollutant evaluated would be much less because only a portion of the pollutant would be generated within the 5.6 km (3 nm) boundary limit of the SDAPCD while the support vessels would be in transit to the test location.

Emissions from the proposed action would be limited to operation of the two ocean test vessels and the auxiliary generators on the support barge during the course of the PSS ocean test. The analysis of the PSS ocean test focuses on total emissions expected from the proposed test vessels, as well as potential impacts of the action on the attainment status of regional air basin for regulated pollutants. For the purpose of estimating expected emissions from the proposed action, emission factors from USEPA's AP-42 were used.

4.2.2 PSS Ocean Test Location

4.2.2.1 Proposed PSS Ocean Test Location

Emissions associated with the proposed PSS ocean test would be emitted from two marine test vessels and the test barge auxiliary generators. The vessels used for the test would use two 1,250-horsepower engines and two 425-horsepower engines. The barge would employ two auxiliary generators with ratings of 50 KW and 25 KW.

Based on the air quality analysis, emissions associated with the PSS ocean test would result in a small incremental increase of all criteria pollutants in 1999. A summary of total emissions expected from the proposed PSS ocean test is presented in Table 4-2.

Table 4-2. Summary of Total Emissions from Proposed PSS Ocean test (tons/year)

Equipment	**VOC**	**NO_x**	**CO**
Surface Vessels	0.08	0.58	0.17
Diesel Generators	0.07	0.82	0.18
Total Proposed Action	0.15	1.40	0.35
SDAB *de minimis* thresholds (tons/year)	50	50	100
SDAB regional emissions	87,600	80,300	547,500

Clean Air Act General Conformity Analysis

Emissions of criteria pollutants associated with the proposed action are below the *de minimis* levels, and the emissions are not regionally significant (i.e., greater than 10 percent of the air basin's emissions budget). The proposed action is exempt from the requirements of a full conformity determination under the General Conformity Rule. As presented in Table 4-2, emissions resulting from the proposed testing would not exceed *de minimis* levels for affected air basin (refer to Table 4-1). This action would conform to the SIP for air quality. The Record of Non-Applicability (RONA) and worksheet for the PSS test are included in Appendix B.

4.3 MARINE ENVIRONMENT

4.3.1 Approach to Analysis

For the PSS ocean test, potential impacts would be limited to water quality and marine sediment issues due to the metals contained in individual test components. Determination of significant impacts on marine water quality is based upon criteria in the *Water Quality Control Plan for Ocean Waters of California* (The Ocean Plan) established by the SWRCB (SWRCB and California EPA 1997) and the *USEPA National Ambient Water Quality Criteria* (USEPA 1986). would all PSS components upon completion of testing. Therefore, the proposed PSS ocean test would not have a significant impact on water quality.

4.3.2 PSS Ocean Test Location

4.3.2.1 Proposed PSS Ocean Test Location

Area outside California Coastal Zone Waters

Water Quality

Under the proposed PSS ocean tests, there would be no physical discharges to the marine environment in waters outside of the California Coastal Zone (CCZ), which is defined as extending from shore to a distance of 3 nm (5.6 km) from the shore. All component surfaces of the MIUW R&D passive LBA array and the PSS impulsive system with the potential to corrode are encapsulated in a chemically inert polyurethane (rubber-like) boot, coating, or secondary housing. This encapsulation would prevent all potentially corrodible metals from contacting the environment. Alkaline batteries will be used in the ocean test in the passive receive array; however, there would be no exposure of inner battery constituents to seawater and no discharges to the marine environment due to the encapsulation. In addition, the MIUW R&D passive LBA array used in support of the PSS test would be removed upon completion of the test.

Marine Sediments

Passive receive array components have been designed to minimize drag, limiting sediment disturbance. Since the array and its associated cable to be deployed in the water would only be 3.8 cm (1.5 inches) and 0.38 cm (0.15 inches) (respectively) in diameter, sediment disturbance would be minor. In addition, increases in turbidity would be minimal.

Three anchors would be employed to stabilize the source platform. It is estimated that 200 m^2 /anchor would be momentarily disturbed during deployment and retrieval (600 m^2 total). Any sediment disturbance that would occur would be short-term and not significant. For these reasons, the proposed PSS ocean test would not have a significant impact on marine sediments.

Area within California Coastal Zone Waters

Impacts within CCZ waters would not occur since all PSS test components would be located outside of CCZ waters.

4.4 MARINE BIOLOGY

4.4.1 Approach to Analysis

Marine biology issues related to the PSS ocean test are associated with potential impacts to sensitive habitats or species from the deployment of underwater components in the marine environment. Sensitive habitats or species are those that are demonstrably rare. Threatened or endangered species are protected by federal or state statutes or regulations, or have recognized commercial, recreational, or scientific importance. (Impacts on marine mammals are discussed in Section 4.5.)

Potential impacts to sensitive marine flora associated with the proposed project would come from the cable resting on the seafloor. In areas where a kelp bed exists, the deployment vessel moving through the surface canopy may result in removal of the upper 1.5 m (5 ft) of the canopy or the cable may fall on subsurface kelp resulting in either cutting the plant or dragging it to the bottom. The cable by landing directly on top of it may affect Benthic marine flora.

Since there are no chemical discharges associated with PSS, only physical impacts on marine biological resources are analyzed. In addition, impacts of underwater sound on fish populations are also addressed within this section due to the potential impacts on catchability.

4.4.2 PSS Ocean Test Locations

4.4.2.1 Proposed PSS Ocean Test Location

Area outside California Coastal Zone Waters

Marine Flora

The PSS ocean test would be short-term in duration and would not result in permanent alterations of marine plant composition or populations. PSS operational criteria require that the test location be free of kelp or dense mats of benthic algae.

Historic records indicate that kelp has not been present in the proposed ocean station test location (refer to Figure 3-2). Other benthic marine flora may be present; however, given the small area affected by the cable and the opportunistic nature of marine plants, impacts would not be significant.

The diameter of the MIUW R&D passive LBA array and cabling is relatively small, ranging in size from 0.38 to 3.80 centimeters in diameter. In the case of the largest diameter cable, approximately 3 meters^2 of ocean floor would be in direct contact with the PSS ocean test components. In addition, the system has been designed to minimize the potential for drag, thereby reducing sediment disturbance to the area where components would actually be placed. The PSS array active component would be vertically suspended in the water column with no impact on the bottom sediment distribution.

PSS operational criteria require that the tests be located in a relatively smooth bottom area; therefore, the ocean tests would be sited in an area free of kelp or dense mats of benthic algae. Even if sparse vegetation were located in the region of direct influence, permanent alterations of marine plant composition or populations would not occur because of minimal contact of the cable with marine flora. Therefore, impacts to marine flora would not be significant.

Marine Fauna

The PSS ocean test would be short-term in duration and would not result in permanent alterations to marine fauna. The diameter of the MIUW R&D passive LBA array cables is relatively small ranging in size from 0.38 to 3.80 centimeters. Even in the case of the largest diameter cable, only 3 meters^2 of ocean floor would be in direct contact with the PSS ocean test components. In addition, the system has been designed to minimize the potential for drag, thereby reducing sediment disturbance to the area where components would actually be placed.

Potential impacts on nektonic marine animals (e.g., fish, squid, etc.) would be limited to the momentary disturbance associated with PSS source and MIUW passive array components traveling through the water column and/or reaching the sea floor. Impacts would not be significant since these organisms are highly mobile. Sessile biological assemblages (e.g., infauna and epifauna) directly in contact with PSS ocean test components could be minimally affected due to the minor disruption of the sediment in contact with the MIUW passive array components. Most benthic species have hard outer coverings (e.g., mollusks have shells, crustaceans have exoskeletons), and many benthos have the ability to live buried in the sand (e.g., worms, echinoderms). Consequently, survival would be likely even if a MIUW passive array component were placed directly on a benthic organism. This would not be considered a potential lethal effect, as movement away from the component would be probable. Therefore, impact to marine fauna would not be significant. Furthermore, since no discharges of chemicals would be released into the water column or sediments, no accumulation of chemicals in marine organisms would occur.

Sensitive ocean bottom marine resources in the open ocean are generally scarce since soft bottom habitats typically have low species diversity in relation to hard-bottom or near-shore habitats. Species densities also decrease in relation to depth; therefore, the area outside California Coastal Zone waters would have fewer species. Physical impacts to marine biological resources in the area outside CCZ waters would not be significant.

Impacts of Underwater Sound on Fish and Fisheries

A potential issue related to the proposed tests is that production of underwater noise could affect fish in such a way that their catchability is reduced.

Fish can hear underwater sounds and often react to them. Impacts on fish and the distances at which these behavioral impacts can occur depend on the nature of the sound, the hearing ability of the fish, and species-specific behavioral responses. Changes in fish behavior can, at times, reduce their catchability. Table 4-3 below summarizes the ability of fish to hear sounds and the reactions of fish to those sounds. This information is then used to predict the likely impacts of the proposed PSS ocean test on fish and fisheries.

During underwater sound source operations, the impulsive sound source would be moored due to testing requirements. Because the transmissions would be attenuated, fish would be exposed to acoustic source levels for only a short period of time. If there were a change in fish behavior, it would be of short duration and would not affect catchability. Given the moderate energy level in each pulse at the PSS array and short duration of possible exposure to maximum received levels, the projected sounds would not have deleterious or significant impacts on the hearing abilities of fish.

Table 4-3. Hearing Thresholds (in dB re 1 μPa) for Various Species of Fish

Species	Hearing at Highest Measured Frequency	Hearing Threshold at Frequency of Best Hearing
Cod	119 dB @ 400 Hz	95 dB @ 283 Hz
Cod	110 dB @ 470 Hz	75 dB @ 160 Hz
Cod	140 dB @ 600 Hz	65 dB @ 150 Hz
Pollack	107 dB @ 470 Hz	81 dB @ 60-160 Hz
Plaice	126 dB @ 200 Hz	97 dB @ 110 Hz
Atlantic Salmon	132 dB @ 380 Hz	96 dB @ 160 Hz
Yellowfin Tuna	120 dB @ 1,000 Hz	89 dB @ 500 Hz

Source: Fay 1988.

Threatened and Endangered Species

The Southern California ESU of west coast steelhead was recently listed as endangered and typically spends 2-3 years in marine waters. Although the Southern California ESU of west coast steelhead could potentially occur in the area, no impacts are anticipated since steelhead are a highly dispersed, solitary species when they inhabit the open ocean. Although four federally listed species of sea turtles could potentially occur in the area, preliminary investigations indicate that hearing sensitivity is limited to low frequency bandwidths (60-1,000 Hz) (Ridgway et al. 1969). Sea turtle hearing threshold at 70 Hz has been estimated at 132 dB. There are no acoustic disturbance or temporary threshold data available. However, the 70 Hz hearing threshold is roughly comparable to that measured for small odontocetes and higher than that for pinnipeds (Richardson, 1995). Similarly, the hearing threshold for sea turtles appears to be significantly higher than that for fish found in the area. It is therefore likely that disturbance reactions in sea turtles will be lower than for fish or for small odontocetes (Section 4.5.2). Due to the limited duration of the acoustic signals (about 2.5 milliseconds) and the low duty cycle (minimum time between pulses is 15 seconds), masking effects are not expected to be significant. Due to the low potential of encountering any of the federally protected sea turtles, and the short-term nature of the proposed tests, no impacts are anticipated. Based on this determination, there would be no impact on federally protected marine species (Marine mammals are addressed in Section 4.5).

Area within California Coastal Zone Waters

Impacts to the marine environment inside CCZ waters would not occur because that zone of influence described for the PSS test is outside of CCZ waters. Therefore, impacts to marine flora and fauna in the CCZ would not be significant.

4.5 MARINE MAMMALS

4.5.1 Approach to Analysis

Issues of concern to marine mammals analyzed in this EA include the potential for (1) changes in behavior due to impacts of underwater noise associated with the tests, (2) attraction/ingestion/entanglement/collisions, and (3) chemical contamination. Of these, most attention is devoted to acoustic issues (Section 4.5.2) because marine mammals rely on hearing for feeding and communication. The main noise-producing aspects of the proposed tests are the active acoustic source operations.

In order to determine the ranges at which marine mammals may potentially be affected by man-made sources of sound, three factors must be considered: the acoustical characteristics of the source, the propagation of sound through the ocean environment and the effects of received sound on marine mammals.

The first two factors are comparatively well understood. The acoustical characteristics of the PSS sound source were determined by laboratory measurement. The propagation of sound in the ocean environment was predicted by means of a simple calculation and also by use of a Navy computer program that mathematically models the acoustical characteristics of the ocean and sea floor by means of a range dependent parabolic equation.

The third factor, the effects of received sound on the animal, is the least understood and has been the subject of considerable controversy. The subject of marine mammal reactions to noise is a rapidly evolving field of science. Every effort has been made to use the best available peer reviewed data in conducting the analyses used to prepare this EA.

Underwater sounds would be emitted either incidentally or intentionally during the proposed ocean tests. These include sounds incidental to vessel operations as well as those emitted intentionally to test the PSS equipment. The following analysis addresses whether these sounds have the potential for:

- interference with (mask) the detection of marine mammal calls, or other natural sounds important to marine mammals;
- causing biologically significant disturbance reactions; or
- causing hearing damage or physical injury to marine mammals.

To address these questions, this section briefly presents background on acoustic masking, acoustic disturbance, and the potential for hearing damage. Predictions about the potential acoustic impacts of the major noise-producing elements of the proposed tests on marine mammals are included. Considerations specific to the proposed test are identified where appropriate.

The potential impacts of test activities are analyzed for three groups of marine mammals: mysticetes (baleen whales), odontocetes (toothed whales, dolphins and porpoises), and pinnipeds (seals and sea lions). Activities associated with the proposed ocean test would have essentially no impact on sea otters, given their extremely low numbers in the proposed test area, their restricted/coastal distribution in both the proposed and alternative test area, and their habit of resting (rafting) at the surface with their ears above the water roughly 50 percent of the time. Available data on marine mammal hearing and behavioral reactions are limited to a few species, particularly when attention is restricted to low-frequency sounds (Richardson et al. 1995; Au et al. 1997; Kastak and Schusterman 1998). Accordingly, generalizations about certain species groups are based on test results on related species. For example, studies on the hearing range and behavioral reactions of bottlenose dolphins and a few other small toothed whales (i.e., Risso's dolphin, false killer whale) can be used to draw tentative conclusions about potential reactions of other types of small- and moderate-sized odontocetes that have not been studied. Similarly, audiograms and behavioral responses of California sea lions and harbor seals are referenced to infer likely pinniped responses to test activities.

Both methods of calculating the acoustic propagation from the PSS source indicate that, at worst, the received energy levels will fall below 175 dB re 1 μPa^2-sec (energy) at less than 0.2 km from the PSS active acoustic source.

In addition to acoustic issues, the potential for marine mammal entanglement, ingestion, and chemical contamination are addressed in Sections 4.5.3 and 4.5.4, respectively. Entanglement and ingestion are potential concerns because of the lengths of cable (up to 3 km) and associated equipment to be deployed during the tests. Risk of entanglement, ingestion, and chemical contamination are mitigated by removal of all equipment and cable within two weeks of the test completion. Collisions with vessels and underwater gear are also briefly addressed.

The potential for a marine mammal "take," in accordance with the Marine Mammal Protection Act (MMPA) (16 USC 1361 *et seq.)* is addressed in Section 4.5.5, with emphasis given to species listed as threatened or endangered. The term "take" is statutorily defined in the MMPA to mean "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal." Under the 1994 MMPA amendments, Congress statutorily defined and divided the term "harassment" to mean "any act of pursuit, torment, or annoyance which: (1) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A Harassment); or (2) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to migration, breathing, nursing, breeding, feeding or sheltering (Level B Harassment)."

4.5.2 Acoustic Sources

An impulsive acoustic source array would be used during the proposed test to evaluate system performance. A maximum of 56 hours of active acoustic testing, occurring only during daylight hours, would occur over eight days occurring between mid-August and 30 September 1999.

Potential Impacts from the Moored Source

The PSS impulsive source would be deployed to a mid water position from a moored barge to test the detection and tracking capabilities of a receiving hydrophone array. The source depth would be approximately 80 m (262 feet). The maximum energy source level for impulsive sounds will be 219 dB re 1 μPa^2-sec with a spectrum level of 190 dB re 1 $\mu Pa^2/\sqrt{Hz}$/m in the 300 to 650 Hz band. Odontocetes and pinnipeds have relatively poor hearing at frequencies below 1 kHz, requiring levels near 80-100 dB re 1 µPa for signal detection (refer to Figures 3-5 -and 3-6). Conversely, mysticete ear structure indicates good hearing at these relatively low frequencies (Ketten 1994). Thus, mysticetes are the marine mammals having the greatest potential to be affected by signals from the moored source.
The available information on harassment of marine mammals in the presence of man-made noise is limited as to species, geographical area and type of noise source studied and has for the most part been derived from opportunistic studies. This EA uses the impulsive sound criterion of 180 dB re 1 μPa^2-sec for harassment from single acoustic pulses (Final Environmental Impact Statement (FEIS) Shock Testing the SEAWOLF Submarine, May 1998, Department of the Navy) and reduces that criterion to 175 dB re 1 μPa^2-sec for multiple pulses.

A single received level (175 dB re 1 μPa^2-sec) has been used to define a radius for a harassment zone for mysticetes to pulsed noise. Both a simple spherical spreading loss (20 log r) model and a more sophisticated range dependent parabolic equation acoustic propagation model have been used for these calculations and found to agree that the 219 dB re 1 μPa^2-sec impulsive source spectrum level will produce received levels of less than 180 dB re 1 μPa^2-sec for a single pulse event at a range from the acoustic source of 0.09 km and for multi-pulsed events to 175 dB re 1 μPa^2-sec at 0.16 km from the source. Given this, the potential maximum harassment area for the short duration multi-pulsed

impulsive sound source involved in this test is 0.08 km^2. Similar "proxy" received levels have not been established for odontocetes nor pinnipeds (NRC 1994) but, as mentioned above, these groups all have comparatively poor hearing at frequencies below 1 kHz, so the acoustic harassment zone would be smaller than that for mysticetes.

When the PSS source is operating at its loudest level (i.e. 219 dB re 1 μPa^2-sec), the potential acoustic harassment zone as defined by the 175 dB contour extends 0.16 km from the source (Figure 4-1). During these periods, at least two qualified observer personnel will stand dedicated watch for marine mammals to detect any animals that might approach the moored source (refer to Section 4.5.2.5). If animals approach within 0.2 km of the ship, the sound transmission would be stopped. In addition, operations would be suspended if reduced visibility (i.e. fog) prevented the marine mammal observers from seeing a minimum of 0.2 km, 25% farther than the maximum range for potential acoustic harassment in the multi-pulse event (approximately 0.16 km). The 25% greater range was selected in order to allow for a margin of error in the ability of the visual monitors to determine where 0.16 km was in relation to the source. Table 4-4 shows the expected numbers of marine mammals that might be expected to pass within the PSS system's potential harassment zone based upon species density data derived from Barlow, et al. (1995). As shown, the maximum expected exposure is for common dolphins, with a average value of 0.024 animals that might be expected within the PSS harassment area. It must be noted that these data represent wide area averages for the expected density of marine mammals.

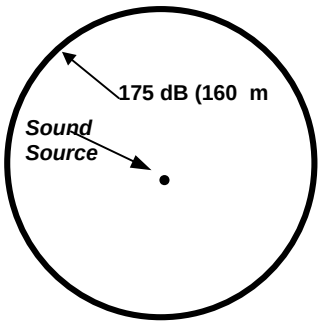

Figure 4-1. Estimated 175 dB re 1 μPa^2-sec Zones of Ensonification

The actual number of animals most likely to be encountered at any given time and place is zero. When animals are present, their numbers in the area may range from one individual up to the low hundreds for some species of odontocetes, including those most likely to be encountered in the test area, small odontocetes such as common dolphins. The large average group size for these species makes it very unlikely that they would be overlooked by the marine mammal observers if the animals should approach within 0.2 km of the acoustic source.

A coastal species of concern, the gray whale, migrates through the Southern California Bight in the winter and spring. Gray whales are not ordinarily found in the SCB in summer and there is very little possibility of a gray whale approaching the PSS array during the August sea test.

Table 4-4. Estimates of Marine Mammals within Acoustic Harassment Area for Summer & Fall

Common Name	Scientific Name	Stock	Status[1]	Animal Density, km^{-2}	Average No. within PSS Area
Mysticetes					
Gray whale	*Eschrichtius robustus*	East. N. Pacific	NL	NA	0
Blue whale	*Balaenoptera musculus*	CA	E	0.0028	0.00026
Fin whale	*Balaenoptera physalus*	CA	E	0.0011	0.000088
Minke whale	*Balaenoptera acutorostrata*	CA	NL	0.0006	0.000048
Humpback whale	*Megaptera novaeangliae*	CA	E	0.0008	0.000064
Bryde's whale	*Balaenoptera edeni*	CA (1991/93)	NL	0.000029	0.0000024
Sei whale	*Balaenoptera borealis*	CA (I 991/93)	E	0.000044	0.0000035
Northern right whale	*Eubalaena glacialis*	N. Pacific	E	NA	0
Odontocetes					
Sperm whale	*Physeter macrocephalus*	CA	E	0.0009	0.000072
Pygmy (or dwarf) sperm whale	*Kogia breviceps*	CA (1991/93)	NL	0.0058	0.00047
Killer whale	*Orcinus orca*	CA	NL	0.0004	0.000032
Baird's beaked whale	*Berardius bairdii*	CA	NL	0.00047	0.000037
Cuvier's beaked whale	*Ziphius cavirostris*	CA	NL	0.0072	0.00058
Beaked whales spp.	*Mesoplodon spp*	CA(1991/93)	NL	0.0039	0.00031
Risso's dolphin	*Grampus griseus*	CA	NL	0.0104	0.00084
Short-finned pilot whale	*Globicephala macrorhynchus*	CA(1991/93)	NL	0.0012	0.000099
Northern right whale dolphin	*Lissodelphis borealis*	CA	NL	0.0115	0.00092
Long-beaked common dolphin	*Delphinus capensis*	CA	NL	0.040	0.0032
Short-beaked common dolphin	*Delphinus delphis*	CA	NL	0.3013	0.024
Striped dolphin	*Stenella coeruleoalba*	CA	NL	0.025	0.0020
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*	CA	NL	0.0151	0.0012
Bottlenose dolphin	*Tursiops truncatus*	CA	NL	0.0018	0.00014
Pinnipeds					
Dall's porpoise	*Phocoenoides dalli*	CA	NL	0.0962	0.0077
California Sea Lion	*Zalophus c. californianus*	U.S.	NL	0.19	0.016
Harbor Seal	*Phoca vitulina*	CA	NL	0.06	0.0044

[1]Status: E = Endangered
T = Threatened
NL = Not Listed

NA = Not Found in Area in this Season

The very small size of the PSS test harassment area (0.08 km^2), in combination with onsite visual monitoring as mitigation in the migration area, would result in no significant biological impacts of the deployed sound source to marine mammals.

4.5.2.1 Masking Effects

Masking is a natural phenomenon whereby a sound source becomes inaudible due to increased background noise. This reduces the distance over which a listener can detect calls or other sounds of interest. Masking can also result from anthropogenic (manmade) sources. The two vessels to be used during the proposed PSS ocean test would be of moderate size and power. Due to the PSS ocean test operational requirements, project vessels would operate mainly at low speeds and for a maximum of 22 days (with 56 hours of active acoustic testing), during the test period. The PSS test vessel operations would not have significant masking effects.

It is unlikely that signals associated with the impulsive moored source would mask acoustic signals important to marine mammals. During impulsive sound transmissions signals would consist of a 2.5 millisecond signal separated by a minimum of 15 seconds with minutes to days between signals. Given these factors, masking effects of the projected sounds on marine mammals would be negligible and, therefore, not significant.

Given the limited area of potential impact, the low likelihood of encountering marine mammals during test operations, and the negligible consequences resulting from potential masking during the PSS ocean test, impacts would not be significant.

4.5.2.2 Disturbance Impacts

As described elsewhere, the proposed tests would include vessel operations and sequences of impulsive sounds to test the PSS receiving equipment. For each major group of marine mammals in the region, this section:

- summarizes what is known about the responses to these types of sounds, based primarily on the review of Richardson et al. (1995); and

- evaluates the expected disturbance impacts of each of these types of sound as they would occur during the proposed PSS ocean test.

<u>Disturbance to Mysticetes (Baleen Whales)</u>

As previously discussed, reaction thresholds of mysticetes to anthropogenic sounds are usually well above the assumed threshold for detection than for other families of marine mammals. However, reaction thresholds vary widely depending on the type of noise and other circumstances. Reaction thresholds can be low for "threatening" or variable sounds, higher for continuous sounds, and much higher for regularly repeated, short impulsive signals (e.g., seismic exploration. In all situations, there may be considerable variation in responses among individual whales.
In the course of the preparation of the SEAWOLF FEIS, a criterion for acoustic harassment of 182 dB re 1 μPa^2-sec was developed; that analysis has been used as a standard in the preparation of this EA, though the PSS range calculations were done with criteria of 180 dB re 1 μPa^2-sec for single pulses and 175 dB re 1 μPa^2-sec for multiple pulses.

Predicted disturbance impacts on mysticetes would be negligible, with no significant consequences to the animals. The range of potential impacts addressed above would not constitute a take by harassment as defined by the MMPA.

Disturbance to Odontocetes (Toothed Whales)

As for mysticetes, odontocete reaction thresholds are generally well above detection thresholds in instances where responses to anthropogenic noise have been described. Reactions can be quite variable, from attraction to active avoidance of noise sources. Examples germane to the proposed PSS ocean test are provided below.

Reactions of odontocetes to steady low-frequency anthropogenic noise have not been studied extensively. In one study, captive beluga whales showed very little reaction to playbacks of recorded low frequency drilling sounds even when received levels were as high as 153 dB re 1 μPa (Thomas et al. 1990). During the Heard Island Feasibility Test, hourglass dolphins were commonly seen in waters where the level of the 57 Hz test sounds was near 160 dB re 1 μPa (Bowles et al. 1994). There have been a few reports of free-ranging odontocetes that apparently showed localized avoidance of areas strongly ensonified by low frequency drilling or dredging sounds. However, responses and sound exposure levels were not well quantified, and in some cases there was considerable tolerance of strong continuous low frequency sounds (Richardson et al. 1995). In general, disturbance thresholds for odontocetes exposed to steady low-frequency sounds are poorly documented but seem high. This is probably related to the high hearing thresholds of most toothed whale at frequencies below 1 kHz (refer to Figure 3-5).

Similarly, there are few reports of odontocete responses to impulsive low-frequency sound in littoral waters. Seismic operators occasionally see dolphins near airgun arrays where received sound levels must be quite high, and there is some evidence of localized avoidance of such arrays (Mate et al. 1994; Arnold 1996; Goold 1996). In general, odontocetes apparently are not strongly disturbed by low-frequency impulsive sounds, again probably because of their high hearing thresholds at low frequencies. Overall, predicted disturbance impacts on toothed whales by the impulsive emissions from the moored source, are expected to be negligible with no significant consequences to odontocetes.

Disturbance to Pinnipeds (Seals and Sea Lions)

As with cetaceans, there are few quantified reports of pinniped responses to anthropogenic noise. Where information is available, it appears that pinniped reactions to noise are quite variable, ranging from tolerance to flight, as summarized below.

Reactions of pinnipeds to continuous low frequency sounds have rarely been reported. However, ringed and bearded seals exposed to low-frequency drilling sounds at received levels as high as 130-140 dB re 1 μPa showed little if any avoidance (Richardson et al. 1995). Although associated noise levels were not reported, sea lions were reported as "common" around oil production platforms offshore California and Alaska (Gales 1982). Harbor seals and California sea lions often tolerate high received levels (140+ dB re 1 μPa) of higher-frequency sound (see next subsection), even though their hearing appears more sensitive at those frequencies (refer to Figure 3-6).

Strong low frequency noise pulses used in attempts to scare pinnipeds away from fishing nets or fish ladders sometimes cause brief startle reactions, but habituation is rapid (Mate and Harvey 1987). Sound source levels of these devices commonly range from 185-195 dB re 1 μPa-m. Sea lions in particular are very tolerant of strong noise pulses, especially when attracted to an area by prey (Richardson et al. 1995). Both phocids and otariids show considerable tolerance of the strong pulses

from marine seismic exploration. Reactions are, at most, subtle and inconsistent even at distances as close as a few hundred meters, where received levels of the seismic pulses are on the order of 190 dB re 1 μPa (Arnold 1996).

Because pinnipeds show tolerance, and often habituate, to strong low-frequency sound, the predicted disturbance impacts on pinnipeds from the moored sound sources during the proposed PSS ocean test would not constitute a "take" by harassment as defined by the MMPA and would be insignificant.

Summary of Potential Disturbance Impacts

Emissions from the moored sound source may cause minor disturbance to some mysticete whales, but probably not to odontocetes or pinnipeds. The vessels associated with the PSS Ocean Test are of moderate size and would move at slow speeds; noise associated with vessel operations would be negligible. Given the negligible consequences of minor disturbance, the limited area of potential impact, and the low likelihood of a marine mammal being present during the proposed tests, impacts would not constitute a "take" by harassment as defined by the MMPA and would not be significant.

4.5.2.3 Hearing Damage

In humans and other terrestrial mammals, exposure to high levels of sound within the frequency range to which the auditory system is sensitive can lead to temporary reduction in sensitivity, termed Temporary Threshold Shift (TTS). If the noise exposure is sufficiently prolonged, or the level is sufficiently high, the noise can cause permanent hearing impairment, termed Permanent Threshold Shift (PTS).

There is little direct information about the levels of noise necessary to cause TTS or PTS in marine mammals. Recently, Ridgway et al. (1997) reported preliminary results of the first TTS experiments with bottlenose dolphins. After baseline masked-hearing thresholds were obtained, TTS was induced in each of four dolphins using high amplitude 1-second pure-tone-bursts at three discrete frequencies: 3 kHz, 20 kHz and 75 kHz. Temporary threshold shifts were observed above 194-201 dB at 3 kHz, 193-196 dB at 20 kHz, and 192-194 dB at 75 kHz. Of note, agitation by the dolphins was observed at levels above 186 dB at 3 kHz, 181 dB at 20 kHz, and 178 dB at 75 kHz (all dB re 1 μPa). Ridgway et al. (1997) conducted the experiments specifically to address auditory criteria for three Navy sonars, and cite the need for additional research, including replication and testing across greater frequency ranges and with additional species. Overall, however, the preliminary results indicate that for bottlenose dolphins, TTS is lower at higher frequencies.

For pinnipeds, the only specific information on noise-induced TTS or PTS is for a harbor seal (Kastak and Schusterman 1996). This seal was intermittently exposed, over a 6-day period, to airborne noise from sandblasting. The received level was 90-105 dB re 20 μPa overall, and 75-90 dB re 20 μPa in the 1/2-octave band centered at 100 Hz (please note use of the in-air standard reference level of 20 μPa versus the 1 μPa reference used for underwater sounds). Immediately after this noise exposure, the seal's in-air hearing threshold at 100 Hz was increased by 8 dB above the pre-exposure thresholds (i.e. 72 versus 64 dB re 20 μPa), and the seal had more difficulty in determining the presence or absence of the 100 Hz test tone. Complete recovery occurred by 1 week after the end of the noise exposure, indicating that hearing impairment was temporary, not permanent. Of note, TTS was evident at 100 Hz, even though the received level of sandblasting noise in the 1/2-octave band near 100 Hz was only about

10-25 dB above the normal hearing threshold at that frequency. Kastak and Schusterman (1996) speculate that the TTS at 100 Hz was related to higher received noise levels at lower or higher frequency bands.

The likelihood of TTS and PTS is briefly addressed below, based on frequency-band and source levels of the PSS ocean test acoustic source.

No TTS or PTS is expected for any marine mammal exposed to sounds from the moored source. As described in previous sections, these sounds are all low frequency (less than or equal to 1 kHz) with maximum energy source levels at 174-219 dB re 1 μPa^2-sec. In a recent study of TTS in bottlenose dolphins, some animals responded negatively to 3 kHz tonal sounds with received levels of 186 dB re 1 μPa, but did not exhibit TTS until exposed to sound levels at 194 dB re 1 μPa and higher (Ridgway, 1997). At their source, the sounds with frequencies below 1 kHz from the vessels are at least 20 dB below the TTS level, and 12 dB below agitation levels, suggesting there is no significant likelihood of TTS or agitation in odontocetes. Although few data are available for pinnipeds for TTS underwater, one might expect TTS in pinnipeds at somewhat lower received levels based on comparison audiograms depicting pinniped and odontocete hearing at 1 kHz. Although otariid thresholds are only approximately 5 dB lower than odontocetes at 1 kHz, phocid thresholds are roughly 15-20 dB lower than those of odontocetes (refer to Figures 3-5 and 3-6).

As discussed earlier, mysticetes are thought to have acute hearing at frequencies less than or equal to 1 kHz. Still, because TTS requires comparatively long-term exposure to noise, the likelihood of any TTS or PTS to mysticetes is remote. Rorquals, including blue, fin, Bryde's, and minke whales, are typically fast swimming animals (approximately 5-7 knots), humpbacks somewhat less so (approximately 4-5 knots), while northern right whales and gray whales are comparatively slow swimmers (approximately 2-5 knots). As mentioned earlier, the PSS operating area would be away from areas of concentration for these species, so no long-term exposure to the sound transmissions is anticipated. Even a very slow-swimming (2 kts or 3.7 km/hr) mysticete passing through the PSS operational area during transmission of the 219 dB re 1 μPa^2-sec impulsive source would pass through the 160 m radial zone defining the 175 dB boundary in roughly 5 minutes. Note that the swimming speed used in this hypothetical example is roughly half that reported by Swartz and Jones (1987) for migrating whales (refer to page 4-17). In addition, the dedicated watch, which will accompany transmission of the 219 dB re 1 μPa^2-sec impulsive source, will serve to insure that mysticete whales are not exposed to loud sounds for periods long enough to cause TTS or PTS. Only daylight transmissions, with visibility of at least 0.2km, will be allowed in order to permit visual observations. Overall, with visual mitigation during continuous transmission and short exposure times during pulsed transmissions, there is no significant possibility of TTS or PTS to mysticete whales during the PSS ocean test and no impacts are anticipated.

In summary, the moored source operations would not cause TTS or PTS in any marine mammal. It is likely that an animal transiting the test area would be exposed to transducer operations at much lower "detection" levels and would have the opportunity to move away before being exposed to levels required for TTS. Therefore, impacts would not be significant and would not constitute a take by harassment as defined by the MMPA.

4.5.2.4 Summary of Potential Acoustic Impacts

Potential acoustic impacts of PSS ocean test operations on marine mammals vary with hearing capabilities of each major group (refer to Section 3.4.3.1) (Table 4-5). For example, mysticete whales may hear noise from the moored source. However, maximum source levels for the pulsed sources (219

dB re 1 μPa^2-sec) are such that the area ensonified to levels above 175 dB is very small. Thus the moored source noise would not affect mysticete whales. It is not expected that odontocetes or pinnipeds would be affected by moored source noise due to comparatively poor hearing at frequencies less than or equal to 1 kHz. As stated at the outset, it is not expected that any noise associated with PSS ocean test operations would affect sea otters due to their exclusive occupation of coastal waters.

Table 4-5. Potential Impacts of the PSS Acoustic Source on Marine Mammals*

Marine Mammal	Acoustic Source (dominant frequencies)	
	Vessels (< 1 kHz)	Moored Source (300-650 Hz)
Mysticetes	Negligible	Unlikely
Odontocetes	Negligible	Negligible
Pinnipeds	Negligible	Negligible
Sea Otters	Negligible	Negligible

* Based on marine mammal hearing capabilities as summarized in Ketten (1992, 1994) for mysticetes, and in Figures 3-5 (odontocete) and 3-6 (pinnipeds).

Area outside California Coastal Zone Waters

Acoustic impacts from the PSS ocean test will not result in a "take" by harassment of any marine mammal as defined by the MMPA (refer to Section 4.5.1). It is the interpretation of NMFS (1995, 1997) that minor changes in behavior do not constitute harassment under the MMPA. Furthermore, since the 1994 MMPA amendments were adopted, the NMFS has not expressed an interest in requiring take permits for vessels or for common vessel devices that employ active acoustics such as fish finders. Although the behavioral responses of marine mammals to low frequency anthropogenic noise have been the focus of recent study (e.g., Clark et al. 1988;Tyack 1998), there as yet are no firm conclusions as to specific noise levels that constitute "take" by harassment as defined by the MMPA. Based on the best-available data, it seems that potential marine mammal reaction to the noise-producing elements of the PSS test would be minor. Therefore, no significant impacts to marine mammals would occur as a result of the proposed PSS ocean test, and all potential impacts would be expected to be below the threshold requiring incidental take authorization.

Area within California Coastal Zone Waters

The PSS acoustic source and the zone of potential acoustic harassment (radius = 0.16 kilometers) will be located outside of California Coastal Zone waters. Given the rapid attenuation of the energy level of the source to below 175 dB within 0.16 km of the source and the additional mitigation efforts implemented for the PSS test, no impacts on marine mammals are expected to occur.

4.5.2.5 Mitigation Measures for Acoustic Issues

The proposed PSS ocean test is not intrusive and has been designed to minimize environmental impacts, including potential impacts to marine mammals. Although acoustic impacts associated with the proposed tests would not be significant even without mitigation, the following mitigation measures would be adopted to ensure that the PSS ocean test would have negligible impacts on marine mammals (Table 4-6).

Table 4-6. Mitigation Measures for Marine Mammals during PSS Ocean test Acoustic Transmissions

Acoustic Source Pulsed**	Watch Type* Visual	Dedicated	Operations Curtailed
219 dB re 1 μPa^2 –sec @ 1m	√	√	Mysticetes, pinnipeds, or odontocetes within 0.2 km

*A dedicated watch will begin 30 minutes before the start of any acoustic transmission and will continue for the duration of the transmission. Acoustic transmissions will be suspended if reduced visibility conditions (e.g. fog) prevents the marine mammal observers from seeing farther than the safety range for potential acoustic harassment (approximately 0.2 km).
** Acoustic transmission during daylight hours only.

For the proposed PSS ocean test a *dedicated watch* will be conducted by two personnel specifically trained in marine mammal identification who will have no other duties. A visual watch of waters within 0.2 km of PSS support vessels, by personnel whose primary duties involve safety of navigation, would be conducted at least 30 minutes before and continue during any impulsive sound source transmission.

These mitigation measures are not necessary to support the finding that impacts would be below the threshold of significance, and would be below the threshold of take by harassment as defined by the MMPA. There is no direct evidence that any marine mammal species would modify their normal behavior in response to the localized, short-term impacts generated by implementation of the proposed ocean test operations. However, avoidance of overlap in the operating area, active sound transmissions during daylight hours only, visual monitoring, and delay of active acoustic operations have been integrated into PSS ocean test planning. They have been integrated because the procedures would not have an overall adverse impact on PSS ocean test activities and they provide additional assurance that there would be negligible impacts on marine mammals.

4.5.3 Attraction, Collision, Entanglement, and Ingestion Issues

It is possible that activities associated with the PSS ocean test could attract marine mammals, and lead to potential for collision, entanglement, or ingestion of test-related materials. Although this possibility is extremely remote, these factors are considered in the following subsections.

4.5.3.1 Attraction and Collisions

The primary attractants for marine mammals are other members of their own species, areas of prey concentration, and (in the case of toothed whales that bow-ride) moving boats. None of the activities associated with the proposed PSS ocean test would be expected to concentrate prey organisms for marine mammals, nor to make food more readily available to them. Project vessels might attract dolphins to bow ride. This could result in exposure of these animals to sounds transmitted by the moored source. Although this is unlikely due to slow vessel speeds required for test operations, sounds received by bow-riding dolphins would primarily be those from the ship.

Minke whales are sometimes attracted to stationary boats and may remain with them for hours (Richardson et al. 1995). This species occurs in both the proposed and alternative PSS ocean test area, but is not expected to linger within test areas.

On infrequent occasions, whales and ships collide, resulting in injury or death to the whale. Most reports of ship collisions with marine mammals have involved baleen and sperm whales, but bottlenose dolphins also have been struck (Richardson et al. 1995). Slow-moving species, especially the right whale and gray whale, are most likely to be struck by ships. For the past 3 years the U.S. Navy has required that its crews report all observed collisions with marine mammals. There have been no reports of collisions with marine mammals on the most extensively used portion of the SCB, Pt. Mugu Sea Range. In assessing the likelihood of collisions it is relevant to consider the following: baleen and sperm whales often try to avoid approaching vessels, the limited amount of Navy vessel traffic as compared with commercial vessel traffic, Navy vessels on the Sea Range or those associated with the proposed PSS ocean test do not operate at high speed, and the absence of reported collisions on the Sea Range. Given this, it is unlikely that a marine mammal would be injured or killed by collision with a Navy vessel during any given year. Because of the rarity of the northern right whale (the species least able to avoid ships) in the SCB (see section 3.4.2.1), the probability of a collision with this highly endangered species approaches zero. Although the possibility of a collision between a marine mammal and a Navy vessel conducting PSS ocean test cannot be absolutely excluded, the frequency of injury or death is very low and effects on marine mammals populations will not be significant.

Area outside California Coastal Zone Waters

The potential for marine mammal attraction to or collision with vessels associated with PSS ocean test is higher within CCZ waters of the mainland or island shore. As reviewed earlier, cetaceans and pinnipeds are generally more abundant closer to shore, so the likelihood of interaction is higher there. Overall, however, the two vessels associated with the PSS ocean test would not add substantially to the vessel traffic already common to both the proposed test areas.

Conversely, the potential for marine mammal attraction or collision in association with PSS ocean test is lower in waters farther from shore, because in general marine mammal relative abundance decreases with distance from shore. As reviewed in the preceding section, however, complex topography can belie this general rule of thumb because animal abundance is influenced by prey availability, which is usually enhanced over topographically complex regions (such as certain regions in the proposed test area). Visual mitigation, as described in Section 4.5.2.5 should further reduce any chance of attraction or collision with marine mammals.

Area within California Coastal Zone Waters

The potential for impacts due to marine mammal attraction or collision inside CCZ waters would be similar to that described for the area outside of CCZ waters while in transit to the test location.

4.5.3.2 Entanglement and Ingestion

Area outside California Coastal Zone Waters

Marine mammals sometimes ingest plastic bags and other small objects and commonly become entangled in fishing gear. However, the equipment planned for deployment during the proposed PSS ocean test does not have characteristics likely to cause entanglement. Even though laydown of cable for the passive MIUW LBA array is anticipated (< 3 km), all cable line is designed to rest on the seafloor. At any one location, the cable would consist of a single line extending more-or-less linearly along the bottom until rising to mate with the processing capability located on the moored barge. It is highly unlikely that any marine mammals would become entangled with this arrangement of cables.

Most species do dive to or forage near the bottom, and any that do would not become entangled in a single cable. Situations where marine mammals do become entangled usually involve fishing gear or flotation lines, where the animals become ensnared in multiple lines or meshes. This situation would not occur in this project. Other gear associated with the test is too large to be ingested, and in any case does not have properties that would be attractive to marine mammals.

All in-water components would be removed within two weeks of the completion of the test. The equipment deployed during the PSS ocean test would not pose an entanglement nor ingestion risk to marine mammals. Therefore, the exposure of marine mammals to cables would be temporary and would not be significant.

Area within California Coastal Zone Waters

The potential to become entangled within PSS related gear should be non-existent as all equipment will be located outside of CCZ waters.

4.5.4 Chemical Contamination Issues

All PSS component surfaces with the potential to corrode are encapsulated in chemically inert polyurethane (rubber-like) boots, coatings, or secondary housings. This encapsulation would inhibit virtually all corrosion-related metals from contacting the environment. There would be no discharges to the surrounding marine environment. Thus, neither marine mammals, nor their prey, would be impacted by materials associated with the PSS ocean test.

4.5.5 Potential for Marine Mammal Take

Based on the analyses described in Sections 4.5.1 through 4.5.4, there would be no anticipated marine mammal take, as defined by the amended MMPA, associated with the proposed PSS ocean test operations. Overall, the likelihood that a marine mammal take would occur within the area ensonified at noise levels greater than 175 dB (energy) by the impulsive source are very small (0.16 km from the source), thereby making the likelihood of exposure of marine mammals to high received levels quite remote. In addition, mitigation measures would be implemented (refer to Section 4.5.2.5) so that the potential for affecting a marine mammal take is negligible.

4.5.5.1 Threatened and Endangered Marine Mammals

Three mysticete species (blue, fin and humpback whales) and one odontocete species (sperm whale) common to the proposed PSS ocean test location are federally listed as endangered (refer to Table 3-3). In addition, Guadalupe fur seals and sea otters are listed as threatened.

As stated above, based on analyses presented in the preceding sections, there would be no anticipated impact on federally listed threatened or endangered marine mammals posed by the proposed PSS ocean test. The proposed tests would be conducted well away from known areas where endangered mysticetes feed and aggregate. Thus, although a few individuals may hear sounds associated with PSS ocean testing, they are not likely to be affected by them.

4.6 TERRESTRIAL BIOLOGY

4.6.1 Approach to Analysis

Since there are no onshore components, there are no impacts that could be considered significant associated with the proposed ocean test affecting federally listed threatened, endangered, or candidate species, or their critical habitat; or habitats identified as sensitive by the California Natural Heritage Programs.

4.6.2 PSS Ocean Test Location

4.6.2.1 Proposed PSS Ocean Test Location

Area outside California Coastal Zone Waters

Activities associated with the proposed ocean test would involve the use of two marine vessels and a moored barge located offshore and would occur entirely within the marine environment. Contact with terrestrial species would be limited to permanent or seasonal nearshore, marine, or offshore birds. Boating activities are common in the area and are not known to adversely affect sight-feeding bird species. Therefore, impacts to terrestrial species, including federally or state-listed sensitive species, would not be significant.

Area within California Coastal Zone waters

The only PSS activities that will take place in California Coastal Zone waters are transits via ship from the harbor where the test ships are located to the PSS test site, located outside of CCZ waters.

4.7 LAND USE, TRANSPORTATION, AND RECREATION

4.7.1 Approach to Analysis

This analysis focuses primarily on ocean test activities and how they would affect issues such as commercial shipping, recreational boating, commercial and recreational fishing, and ocean tourist activities, particularly in the coastal zone since the PSS ocean test has no impacts ashore. Results of the noise analysis are incorporated into this section as needed. Specifically, this analysis addresses the potential for noise contours associated with proposed activities to affect land use in the areas surrounding the proposed test locations. Compatibility of Navy operations with local planning policies and state coastal policies (which apply to coastal waters out to 5.6 km (3 nm) from any landmass) are specifically addressed.

4.7.2 PSS Ocean Test Location

4.7.2.1 Proposed PSS Ocean Test Location

Area outside California Coastal Zone Waters

Recreation

As discussed in Section 3.6, the majority of commercial and recreational fishing, recreational boating, diving, and ocean tourist activities occur relatively close to shore. Given the small area in which the ocean test would occur and the limited duration of the test, impacts to land use and recreational resources would not be significant.

Transportation

The PSS ocean test would be sited to avoid major shipping lanes and heavily used areas. The majority of commercial fishing and recreational vessels transit nearshore areas. Therefore, impacts to marine traffic would not be significant.

Area within California Coastal Zone Waters

Land Use

As discussed, all components supporting the PSS test will be located offshore of the CCZ. Therefore land use will not be impacted.

Recreation

As discussed in Section 3.6, commercial and recreational fishing, recreational boating, diving, and ocean tourist activities occur at various locations off the coast of Southern California, especially in the shallower waters near the main coastline and offshore islands.

Because the majority of commercial and recreational fishing, recreational boating, diving, and ocean tourist activities occur relatively close to shore within areas excluded from the proposed testing, implementation of the proposed PSS ocean test would not result in significant impacts to existing land uses or recreational resources. Furthermore, the ocean tests would be temporary, lasting a total of 22 days (56 hours of active acoustic testing). During the ocean tests, fishermen and recreational users could operate within the test area, given a safe distance from the test vessels (approximately 1 km [0.6 mile]). The Navy and its contractors perform military operations within this region which does not conflict with fishing or recreational uses, even during the peak fishing season. Given the area in which the ocean tests would occur and the limited duration of the tests, impacts to existing recreational resources would not be significant. Refer to Section 4.11 for a discussion of recreational diver safety.

Transportation

As discussed in Section 3.6, major shipping lanes are located within Southern California. The area has also historically been utilized for military operations. To minimize potential impacts to transportation, the ocean tests would be sited to avoid major shipping lanes and heavily utilized military operation areas. Also, a NOTMAR would be issued 48 hours prior to commencement of the tests to give regular

boat traffic ample notice prior to testing in a given area. For these reasons, and due to the temporary nature of the test, impacts to marine traffic would not be significant.

4.8 SOCIOECONOMICS

4.8.1 Approach to Analysis

This socioeconomic analysis addresses the potential of the proposed PSS ocean test to adversely affect socioeconomic activities that occur within the boundaries of the proposed ocean test site (refer to Figure 2-5). Potentially affected socioeconomic activities that are somewhat unique to this action include commercial shipping, commercial fishing, and tourist-related activities.

Primary socioeconomic issues of concern identified include those associated with continued viability of affected commercial fishing and shipping industries, and Environmental Justice and Children's Justice (e.g., impacts with regard to minority communities, poverty status, and impacts to children). Implementation of the proposed action at either of the ocean test locations would have the potential to affect commercial fishermen if the proposed testing displaced them from their primary means of livelihood during the peak fishing season. Significant impacts occur when a project adversely affects the economic viability of individuals, groups, or larger populations, or disproportionately affects human health or the environment in low-income, minority areas, or disadvantaged populations.

4.8.2 PSS Ocean Test Location

4.8.2.1 Proposed PSS Ocean Test Location

Area outside California Coastal Zone Waters

Although some commercial and recreational fishing and recreational boating occurs outside CCZ waters, the majority of these activities occur within CCZ waters. Further, no permanent populations are located outside CCZ waters or would be affected by PSS ocean testing in these waters. Therefore, the potential for the proposed PSS ocean tests to disproportionately affect human health or the environment in low income, minority, or disadvantaged populations would not be significant.

Area within California Coastal Zone Waters

Primary impacts are associated with the potential for commercial fishermen and recreational water users to be impacted by the proposed PSS ocean test. However, the ocean tests would be short-term and temporary, lasting a total of 22 days. During the ocean tests, fishermen and recreational users could operate within the test area given that they maintain a safe distance from the test vessels. The Navy and its contractors have performed military operations within this region which does not conflict with fishing or recreational uses, even during peak fishing seasons. Given the small area in which the ocean test would occur, the short duration of the test, and the absence of any permanent population in the area, the potential to disproportionately affect human health or the environment in low-income, minority, or disadvantaged populations would not be significant.

The majority of activities associated with the proposed ocean test would occur within the marine environment and would involve the use of two marine test vessels and a moored barge located offshore. During implementation of the PSS ocean test, commercial ship traffic would likely be present in the proposed ocean test area. However, commercial shipping traffic would not be significantly affected by

the proposed action, given the small area in which the ocean tests would occur. Vessels could continue to operate within a 1 km radius of the test location without interfering with the integrity of the tests. The 1 km radius was selected in order to preserve the efficiency and integrity of the test.

4.9 NOISE

4.9.1 Approach to Analysis

Underwater noise sources and its effects in relation to marine resources are addressed in sections 4.3 through 4.5. Therefore, this analysis characterizes airborne noise impacts. Noise impact analyses typically evaluate potential changes to existing noise environments that would occur from implementation of a proposed action. To adequately assess potential noise consequences, it is important to assess the range of ambient noise that may be expected at any sites of interest. Man-made noise always appears in the context of background noise and should be assessed in relation to it.

4.9.2 PSS Ocean Test Location

4.9.2.1 Proposed PSS Ocean Test Location

Area outside California Coastal Zone Waters

Airborne Noise Environment

Noise-producing elements associated with the proposed PSS ocean test would include continuous sound sources (e.g., vessel engines and auxiliary generators) and transient sound sources (e.g., deck machinery that may not run continuously) operating over a maximum of 22 days. Due to the open ocean setting, human receptors would be limited to test participants and occupants of other vessels transiting the areas. Wildlife receptors would be primarily limited to seabirds in transit. Project-related airborne noise associated with the operation of two vessels characterized by regular boat traffic would not contribute substantially to existing ambient noise conditions. Due to the limited noise generated and the lack of sensitive receptors, the introduction of airborne noise from additional vessels in the proposed test area would not cause a significant impact.

Area within California Coastal Zone Waters

No PSS operations that may require consideration of possible airborne noise impacts will take place in CCZ waters.

4.10 CULTURAL RESOURCES

4.10.1 Approach to Analysis

The methodology for identifying, evaluating, and mitigating impacts to cultural resources has been established through federal laws and regulations including the National Historic Preservation Act (NHPA), the Archaeological Resource Protection Act, the Native American Graves Protection and Repatriation Act, and the American Indian Religious Freedom Act.

A project affects a significant resource when it alters the property's characteristics, including relevant features of its environment or use that qualify it as significant according to NHPA criteria. Impacts may include the following:

- physical destruction, damage, or alteration of all or part of the resource;
- Alteration of the character of the surrounding environment that contributes to the resource's qualification for the NHPA;
- introduction of visual, audible, or atmospheric elements that are out of character with the resource or alter its setting; and
- neglect of the resource resulting in its deterioration or destruction.

4.10.2 PSS Ocean Test Location

4.10.2.1 Proposed PSS Ocean Test Location

Area outside California Coastal Zone Waters

The majority of activities associated with the proposed ocean tests would occur within the marine environment and would involve the use of two marine test vessels and the moored barge. The primary impacts from the proposed ocean test would be the potential for underwater archaeological resources to be affected by the laydown of PSS components on the ocean floor. As discussed in Section 3.9, Cultural Resources, the majority of known underwater cultural resources (e.g., shipwrecks) in the region occur in less than 10 m (33 ft) of water. The most concentrated locations of shipwrecks are along headlands and harbor approaches and within inner harbor waters on the main coastline and offshore islands. Implementation of the proposed action may result in the laydown of PSS system components in the vicinity of known shipwrecks. However, given the limited potential for sediment disturbance as result of laydown, underwater archaeological resources are unlikely to be affected by the laydown. Therefore, the potential for impacts to underwater archaeological resources outside CCZ waters would not be significant.

Area within California Coastal Zone Waters

The majority of known underwater cultural resources generally occur in less than 10 m (33 ft) of water. Some shipwrecks may occur in offshore waters, but the majority of shipwrecks are located near islands and the mainland. Therefore, the potential for impacts to underwater archaeological resources inside CCZ waters would not be significant given that no components of the PSS test are expected to be located within CCZ waters.

4.11 SAFETY AND ENVIRONMENTAL HEATH

4.11.1 Approach to Analysis

For the purpose of this analysis, impacts are considered significant if the general public is endangered as a result of PSS test activities. For the proposed action, there are specific, documented procedures in place to ensure that the general public is not put in danger by PSS test actions.

Issues associated with implementation of the PSS system include public safety, which addresses the potential exposure of public citizens to unsafe conditions. Since the proposed action involves activities on the ocean and in coastal areas, safety issues focus on public access to the proposed test sites, especially for divers.

4.11.2 PSS Ocean Test Location

4.11.2.1 Proposed PSS Ocean Test Location

Area outside California Coastal Zone Waters

As discussed in Section 3.10, commercial, military, and recreational vessels commonly transit the area. Public safety issues are related to heavy boating and shipping activity, as well as commercial and Navy testing operations and recreational activities that occur throughout Southern California. Given the small area in which the ocean tests would occur and that PSS test vessels would only require less than 1 km (0.6 mile) clearance to efficiently and safely conduct the proposed tests, other activities would not occur in the vicinity of the test to avoid interfering with the integrity of the tests.

During vessel operations, deployment activities, and retrieval operations, standard operating safety procedures would be implemented to protect public nonparticipants and military personnel. The Navy would ensure that the test area is free of nonparticipants (recreational and commercial users) and use established clearance procedures (including prior notice to the USCG of plans to conduct testing and the issuance of a NOTMAR [see Section 4.7, Land Use]). The test location is selected to avoid shipping lanes and populated areas.

Retrieval of all PSS components would be achieved upon conclusion of the tests. To minimize the risk of excess cable becoming entangled with an object and interfering with the test, the Navy would use the minimum length of cable necessary to perform the tests. MIUW passive R&D array components sink in ocean water; therefore, once components are laid on the ocean floor, the cable would not be expected to be influenced by underwater currents and would not constitute a safety hazard during testing periods. Therefore, given standard component retrieval procedures, impacts to public safety would not be significant.

Safety thresholds have been established for exposure of humans to EMF at various frequencies (American National Standards Institute, 1991). However, the proposed PSS system would not generate substantial EMF. The majority of the underwater components utilize photo-optical signals, which do not generate EMF. Electrical signals and corresponding low levels of EMF would occur at the pressure vessels and hydrophone arrays. However, PSS is a low-power system and would not generate EMF of concern to humans or marine life.

According to Navy references (NSWC, 1983 and NAVSEA, 1995), diving activities are not appropriate within 0.2 km of this sound source. The majority of recreational diving takes place within 1 km (0.6 nm) of shore, inside approximately the 30 m (100 ft) isobath. As noted previously, no other activities such as diving operations would be located in the vicinity of the PSS test to preserve the efficiency and integrity of the test.

Area within California Coastal Zone Waters

Public safety issues in this area are related to boating and shipping activity, and limited recreational activities. Because the source will be outside of CCZ waters in a depth of about 91 meters (300 feet) and because of the very small area (0.03 km^2) that would present a noise hazard for divers, no significant effects to divers would occur. Given the small area in which the ocean tests would occur and that PSS test vessels would require less than a 1 km clearance, other activities could occur within the

vicinity of the test location without interfering with the integrity of the tests. Therefore, impacts to public safety would not be significant.

4.12 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, the proposed PSS ocean test would not be conducted. Existing environmental conditions for resources potentially affected by the proposed action, as described in Chapter 3 of this EA, would remain unchanged. Consequently, implementation of the No-Action Alternative would have no impact and cause no change to the existing environment.

4.13 MEANS TO MITIGATE ADVERSE ENVIRONMENTAL IMPACTS

The proposed PSS test is not intrusive and has been designed to minimize environmental impacts. However, the following mitigation measures have been recommended and incorporated into the PSS ocean test program to minimize any potential for impacts to threatened and endangered terrestrial species or acoustic impacts to marine mammals (refer to Section 4.5.2.5). Mitigation measures in the form of avoidance, design modification, resource restoration and preservation, or compensation are frequently implemented to lessen adverse environmental impacts that may otherwise occur as a result of a project. In the resource-specific analysis described in Sections 4.1 through 4.11 of this EA, no significant impacts have been identified for any resource.

Marine Mammals

1. For the proposed PSS ocean test, two types of visual searches for marine mammals would be conducted: (1) *a visual watch* by personnel whose primary duties involve safety of navigation, and 2) *a dedicated watch* of two personnel specifically trained in marine mammal identification who will have no other duties. A dedicated watch of waters within 0.2 km of PSS support vessels would be conducted at least 30 minutes before and continue during any impulsive sound source transmission.

2. Impulsive sound source transmission between 190 and 219 dB re l μPa^2-sec energy level would be conducted only during daylight hours and would be halted if mysticetes are seen within 0.2 km of the ship.

3. Acoustic transmissions operations will cease if visibility was reduced (i.e. fog) preventing the marine mammal observers from seeing farther than the safety range for potential acoustic harassment (approximately 0.2 km).

Implementation of the above measures would be incorporated into the PSS test plan and logged during the active transmission period of the PSS test. This data would include the logging of marine mammals sighted during the active transmission periods.

There is no direct evidence that any marine mammal species would substantially modify their normal behavior in response to the localized, short-term impacts generated by implementation of the proposed action. The above mitigation measures have been integrated into PSS test plans because they would not interfere with test operations and it provides further assurance that impacts on marine mammals or threatened and endangered terrestrial species would be negligible.

Threatened and Endangered Terrestrial Species

Implementation of the above mitigation measures into PSS test plans will ensure that test activities would not adversely impact the western snowy plover or any other threatened and endangered terrestrial species.

4.14 ENVIRONMENTAL IMPACTS THAT CANNOT BE AVOIDED

As described in Section 4.13, no significant impacts on resources from implementation of the proposed PSS ocean test have been identified. The Navy would retrieve all components following testing. Therefore, the proposed action would not result in significant adverse environmental impacts.